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ABSTRACT

Several studies were conducted to investigate the nature and development of creative social problem solving among older and younger children in Sweden and the United States. First, the behaviors of older children were investigated formally in a large-scale experimental study of California 10-year-olds. Results indicated that children receiving problem-solving training through the inductive discussion method performed significantly better than controls on several measures of social problem solving. A partial replication of the study was made in Sweden, in which a new data collection method was employed: actual in-class group discussions designed for creative problem-solving training were coded. The development of the variable of autonomy appeared salient among Swedish children. Attention was next turned toward kindergarten children in Sweden to see which problem-solving variables were operating among the younger group. Results indicated that kindergarten children were capable of offering reasonable and creative ideas as to causes and solutions of social problems. American preschool counterparts were then studied to check the validity of hypothesized universals. Relationships between learning styles and problem-solving discussions were investigated. (The concluding section of the report offers comparison of cross-cultural problem-solving behaviors. Related materials are appended, including The Problem Solving Observation Scale Matched to Four Learning Styles, intended for the young child.) (RH)

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A DEVELOPMENTAL COMPARISON BETWEEN PRESCHOOL AND MIDDLE SCHOOL
SOCIAL PROBLEM SOLVING IN TWO COUNTRIES

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PS 013455

Paper presented at the Sixth Biennial Meeting of the International
Society for the Study of Behavioural Development (ISSBD), August,
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A DEVELOPMENTAL COMPARISON BETWEEN PRESCHOOL AND MIDDLE SCHOOL SOCIAL
PROBLEM SOLVING IN TWO COUNTRIES

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The purpose of this study was to investigate the nature of creative social problem solving for older children and younger children in two different countries: Sweden and the United States of America. Theoretical constructs from Getzels and others in the United States form the basis of operational definitions of problem solving for the older children. First the behaviors of the older children were investigated in California with ten-year-olds, where measures were designed. Then the study was replicated in Sweden with ten-year-olds who were followed for three years (same teachers). Coding schemes were devised and applied to creative problem-solving discussions of a social nature. The development of the variable of autonomy appeared salient among these children. Apparently there was an interaction between amount of autonomy and the refraining on the part of the teacher from overcontrol. The investigator next turned attention to development of creative social problem solving among preschool (kindergarten) children in Sweden. Attempts were made to see which variables that were appropriate for inspection among the middle school children were still appropriate for inspection at the preschool level. In essence the task was to see which variables to delete and which variables to add. The coding scheme was accordingly revised. The next step was to pick up an American preschool counterpart and check on the validity of hypothesized universals. In this last study additional personality variables have been added stemming from the work of Rosenberg and taking the form of four learning styles: (1) Rigid inhibited, (2) Undisciplined, (3) Acceptance anxious, and (4) Creative. The coding scheme for preschool problem solving underwent further revision. This is the point at which this presentation is. The rest of the presentation will trace the developmental ramifications between cultures and between these two widely-spaced stages of the development of social problem solving.

(Paper proposal sent to the International Society for the Study of Behavioural Development for the Sixth Biennial Meeting to be held in Toronto, Canada in August, 1981.)

OUTLINE: A DEVELOPMENTAL COMPARISON BETWEEN PRESCHOOL AND MIDDLE
SCHOOL PROBLEM SOLVING IN TWO COUNTRIES

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PURPOSE AND DEFINITION

The purpose of this presentation is to summarize my studies investigating the nature of creative problem solving in two different countries. Our initial and ultimate intent was to intervene when appropriate to encourage further development. But our first trials with older children sent me looking for earlier roots and development of problem solving.

Theoretical constructs helpful in defining our constructs came from many places: from Getzels and Guilford's early work (Getzels, 1964; Guilford, 1967); Piaget's whole spectrum of work; and many others. Constructs include the degree of "unknowns" in the problem situation and thus the possibility of more or less divergent thinking; kinds of problems (social ones in this presentation); the language or vocabulary of problem solving; and more or less productive qualities in the problem solver such as autonomy, empathy, and consequential thinking. In these researches we made every attempt to make sure

* The investigator is deeply indebted to her research assistant Carol Mason Wolfe for work on the latest studies in this series.

the problems were interesting to and appropriate for the children to counteract invalidating effects of boredom. Appendix A details operational definitions used in this study for both younger and older children.

The rendering of purposes into studies is charted in Figure 1. From this figure it is apparent that the problem-solving studies to be synthesized in this presentation represent older children, and younger ones, in America (Santa Barbara and Dallas) and in Sweden (Gothenberg).

Insert Chart of Prob. Solv. Stud., Fig. 1, here, p.2a

This presentation will dwell more on the more recent studies of younger children after first starting with the older ones.

THE OLDER CHILDREN

The Santa Barbara, California Study

First the behaviors of the older children were investigated formally in a large-scale experimental study (supported by the Charles F. Kettering Foundation). We will call this the Santa Barbara Study (Lundsteen 1970; Lundsteen & Wilson, 1979). The following charts give the experimental design and the 1970 and 1979 articles give details of the measures constructed, procedures, and findings.

Insert Figure 2, here, p. 2b "Experimental Design..."

Insert Figure 3, here, p. 2c "Further Detail of Treatment Groups and Problem Solving Measures..."

Figure 1

CHART OF PROBLEM-SOLVING STUDIES PRESENTED

AGE	COUNTRY	
	AMERICAN	SWEDISH
YOUNGER	Level: Kindergarten Age: 5 Places: Dallas, Texas Gooch Public School, (1 class) Date: 1979-80 Lanier Public School, (1 class) Date: 1981	Level: Kindergarten Age: 6 Place: Gothenberg Private Schools (4 classes) Date: 1978-79
OLDER	Level: 5th grade Age: 10 Place: Santa Barbara, California (30 classes) Date: 1967-68	Level: Equiv. 6th, 7th & 8th Grades Age: 10, 11, 12 (Same Children) Place: Gothenberg (2 classes) Date: 1974, 1975, 1976

(Problem solving for Older Children)

Figure 2
EXPERIMENTAL DESIGN FOR
THE THINKING IMPROVEMENT PROJECT

Type of Training	Number of Classes (random assignment)	Administer Pretests September	Types of Experimental Training or Independent Variables				Administer Posttests April 1967 Oct. 1967
			Problem-Solving Lessons	Problem-Solving Practice	Listening Lessons	Levels of Thinking Lessons	
Experimental							
1. E (1)	6	yes	<u>yes</u>	<u>yes</u>	no	no	yes
2. E (2)	6	yes	<u>yes</u>	no	<u>yes</u>	no	yes
3. E (3)	6	yes	<u>yes</u>	no	no	<u>yes</u>	yes
Control							
4. C (1)	6	yes	no	no	no	no	yes
5. C (2)	6	no	no	no	no	no	yes

Figure 3. Further Detail of Treatment Groups and Problem-Solving Measures, Older Children in the Santa Barbara Study

TABLE
Basic Elements for Treatment Groups

Category	Experimental Treatment 1		Experimental Treatment 2		Experimental Treatment 3		Controls 1 & 2
Number of Classes	6 classes		6 classes		6 classes		6 classes ea.
Number of Ss	(N = 130)		(N = 153)		(N = 146)		(N = 254)
Content of Curriculum	Problem-solving concepts	Practice of problem solving concepts	Problem-solving concepts	Listening skills	Problem-solving concepts	Qualitative levels of thinking	State prescribed curriculum and texts
Intensity of training	Two 30 min. lessons	One 30 min. lesson	Two 30 min. lessons	One 30 min. lesson	Two 30 min. lessons	One 30 min. lesson	Three 30 min. lessons
Duration	23 wks.		23 wks.		23 wks.		23 wks.
Weekly Schedule	Tues., Wed.	Thurs.	Tues., Wed.	Thurs.	Tues., Wed.	Thurs.	Tues., Wed., Thurs.

TABLE
Titles, Acronyms or Abbreviations, Highest Possible Rating or Number of Items, Reliabilities, and Brief Descriptions for Dependent Variables

Title	Description of Measurement					
	Items or Rating	Test-retest	N	KR 21	N	Inter-rater ^a
Creative Problem-Solving Tests						
Oral Composition (OCOM)	180	.52	27	—	—	.88
An oral composition concerning a problem with a friend rated on a five-point scale for each of 12 steps in a problem-solving process.						
Written Composition (WRIC)	180	.53	26	—	—	.87
A composition written concerning a problem with a friend rated on a five-point scale for each of 12 steps in a problem-solving process.						
Tell the Story & Make a Plan (OPST)	1224	.74	26	—	—	.90
Two openended stories with 12 steps or question types each designed to elicit written answers and measure choice points during process, which were rated on seven qualities.						

^a The N on which the interrater reliability is based is 200.

In brief, the Santa Barbara study indicated that 10-year-old children receiving problem-solving training (inductive discussion method) performed significantly better than control groups on measures of social problem solving (personal oral, written, and in structured story context). (See Figure 4 for lesson structure used in the training, p. 3a.)

Insert Figure 4, Lesson Structure....(question hierarchy)

These differences persisted over several months' time, according to a retest the following year (Lundsteen & Wilson, 1979). Judges used a scale to assess student response in both a relatively unstructured student taped and student written mode and a more structured written mode where stimulus questions were phrased to tap portions of a problem-solving process. (See lower table in Figure 3 and Appendix A items for the older child.)

The Swedish Older Sample Study

In 1974 a Swedish investigator requested assistance in replicating the Santa Barbara Study in Gothenberg, Sweden (Lundsteen & Strömqvist, 1978). We will refer to this study as the Swedish Older Sample. This time, however, the present investigator advised against the judged scale as used earlier with individual children's private response in favor of coding actual inclass group discussions designed for creative problem solving training. Items on the earlier judgmental scale (Appendix A) were adapted to this newer mode. See Figure 5, p. 3b. The coding of teacher behaviors during the discussion was added to

Insert Figure 5, "Scale Used with Older Swedish Children", p. 3b

LESSON STRUCTURE FOR TIP CURRICULUM

- I. Tips to Teachers: rationale or purpose for the lesson (e.g., provocative quotes)
- II. Objectives for Learner Behavior: A. For the child B. For the teacher
- III. Materials Needed: the content or the data, instructional aids, or equipment
- IV. Lesson Plan

A. Directions to teacher and space for comment	B. SUGGESTED QUESTION HIERARCHY	C. Teaching-learning approach
		<u>Cognitive Readiness</u>
Conduct warm-up. Call on children rapidly. Set open tone of lesson.	WHAT DID YOU NOTICE? WHAT STOOD OUT FOR YOU? (I AM NOT LOOKING FOR ONE PARTICULAR ANSWER)	Openess, verbal fluency Activation (enumeration)
Watch for orienting reactions.	FIRST, TO CHECK UP, WHAT DOES THIS MEAN TO YOU AT THE PRESENT TIME?	Diagnosis of pupil boundaries of concepts → <u>TOTEs</u> Test C
Call on several pupils for the same question. Be willing to wait to give thinking time. Write all pupil responses on board for examination.	WHAT ELSE DID YOU SEE? HEAR? WHO? WHEN? WHERE? HOW? FOR WHAT REASON? WHY? CAN MORE OF YOU RECALL FACTS THAT MIGHT BE USEFUL? DO WE HAVE ENOUGH TO BEGIN GROUPING?	P Given data-- Focus → Operate a Extend → L ReTest D Exit
Wait for thinking time. Indicate groupings on board. Ask similar questions, if needed.	HOW WOULD YOU GROUP ANY OF THESE THINGS? Mary?...Paul?...John?...Pam?	n g Lift--to grouping Extend U
Write labels on board.	WHAT NAME COULD YOU GIVE TO THIS GROUP? Jeff?...Rosa?...Carl?...Tom?	Lift--to labeling Extend O
Use different "lifting" questions depending on objective.		<u>Reinforcement</u> → N
Welcome and acknowledge all responses. There is no "one right one"; there is no one "wrong" one.	WHAT DOES THIS MEAN TO YOU NOW? CAN YOU SUM UP FOR US? WHAT DID THIS DO FOR YOU? AGREE? WHAT DID YOU LEARN? HOW DID YOU FEEL? HOW CAN WE EVALUATE? WHAT DID YOU GET OUT OF IT? WHERE DOES THIS TAKE US? WHAT MIGHT BE THE NEXT STEP?	Continue to: Focus (Summary) Extend M Lift Y
Continue to record.		Direction thus reward
Make outside enrichment assignments.	WHAT COULD YOU TELL AN ABSENT CLASSMATE WE LEARNED? WHAT DID YOU UNDERSTAND? HOW COULD YOU USE THIS SOME PLACE ELSE? (ANOTHER TIME?) HOW WAS THIS LIKE YOU? WHAT MIGHT BE THE SAME? DID YOU EVER? COULD YOU ALSO TRY? OUTSIDE OF THIS PERIOD WOULD YOU LIKE TO?	<u>Transfer</u> → Meaningfulness Set for transfer Similar elements New instances

V. Evaluation at end of lesson for both child and teacher

- A. Child: (1) concepts, (2) behaviors, (3) subskills, (4) problem-solving process
- B. Teacher's approach, self check in guiding: (1) cognitive readiness, (2) reinforcement, and (3) transfer.

Lundsteen

CHILD# 1

10

TOTALS

CODING SHEET
FOR STUDENTS
(Class no. _____)

QUALITIES AND OTHER VARIABLES

HIERARCHY of QUALITIES

STEPS CREATIVE PROBLEM SOLVING

OTHER

REGRESS

LEAP

18

14

to the Swedish study of older children. Interactions between student and teacher behaviors during discussions designed to develop problem solving were noted. (See Figure 6 for the scale used with teachers of older children.)

Insert Fig. 6 "Checklist used with teachers of older children, p. 4a.

Thus revised coding schemes were devised and applied to creative problem-solving group discussions designed to enhance solving of social type problems. (See Appendix A for a sample of operational definitions and a sample of examples used in the Swedish Older Sample Study.) Affective components became more important (empathy, autonomy) in the coding. Since the same Swedish teachers (who followed their children for three years) continued their interest and continued to collect audio taped discussions, this study became longitudinal in nature (Lundsteen & Wilcox, 1977). (N = 2 teachers and 20 randomly selected children, 10 from each class.)

Time sampling was applied to a set of 6 audio-taped discussions of approximately 45 minutes each in length. Translation was made on the first 3 minutes of each of the series of 7 problem-solving steps that the teacher guided the students to explore. The translator, present in the classroom at the time of taping, added additional observations and summarized what occurred between samples. Materials were unfinished Swedish story episodes, with the last being a self-selected, real-life problem. Teachers were trained with materials later published (Lundsteen, 1976).

CHECK LIST USED TO CODE TEACHER PORTION OF TAPED PROBLEM-SOLVING DISCUSSIONS

Figure 6

(of Older Children)

(VARIABLES)

CODING SHEET FOR TEACHERS' BEHAVIORS		TEACHER RESPONSES									
Teacher # _____		PROBLEM-SOLVING STEPS									
TEACHER FUNCTIONS	TEACHER FUNCTIONS	FACTS-CONDITIONS	GROUPING	LABELING	MISSING DATA	SEARCH STRATEGY	MAIN PROBLEM	TYPE OF PROBLEM	HYPOTHESES	TOTAL	
		OPENNESS									
BOUNDARIES											
SUBSKILLS											
FOCUSING ON F & C											
REFOCUSING											
EXTENDING											
LIFTING											
DIRECTION & REWARD											
SUMMARIZING											
SET											
MEANING											
SIMILAR ELEMENTS											
NEW INSTANCES											
CONTROL											
UNCLASSIFIABLE											
TOTAL											

What did we find in the Swedish older sample study using our coding schemes for the class discussions? The children's quality of autonomy proved the most interesting one to us. Autonomous responses suggest a valuing of independence and self-responsibility. Our model for this quality is Rotter's (1966) construct of Internal-External Locus of Control. In essence, Internals view themselves as important decision makers; Externals do not. The externally controlled person often attributes the occurrence of reinforcements to luck, chance, or fate. The internally controlled person has a strong tendency to perceive cause and effect relations between their behavior and what is going on. They themselves can make a difference as to what happens to them in the future. (See Appendix A for student examples.) Bobroff (1960) demonstrated that children develop from external control needs in early childhood toward increasingly more internal symbolic control with age. The seven instances found in the translations may or may not have been affected by the problem-solving instruction designed in part to promote autonomy. The two teachers tended to see the program as an enabling force, and corroborated increase with anecdotes of autonomous behavior, not deemed highly typical in Swedish schools.

Most interesting, apparently there was an interaction between autonomy displayed by the students in constructing portions of the process and the refraining on the part of the teacher from overcontrol. Restated, whenever the teacher exercised a function labeled "Teacher Controls," in which the teacher "fished" for one "right" or preferred idea, the children floundered in the supposedly open situations. They regressed in verbal behavior of chorused "yeses" or other uncodable mazes. And the teacher had to pick up the pieces of the discussion and back track

or start over. In spite of training, the propensity to control is so strong apparently in teachers that this behavior persisted in spite of training throughout the three-year period of collected discussions.

Another student dimension of interest was a skill usually supportive of problem solving in the instances found, called Interaction. In this study interaction was coded when the student's response directly preceded and influenced the content of another student's response. Interaction among students often results in a synthesis producing new ideas for solving based in part on information from others. One student, Katarina, developed Interaction as her predominant mode of responding (Tape 3, Teacher B.) Her interactive responses increased from 22% to 50% for the second year and to 58% for the third year. (Her statement totals were 9, 6, and 12 respectively). Inspection generally suggested that teacher A's group developed in ability to interact with one another during creative problem-solving discussions over the three-year period in a school system where such behavior is not necessarily encouraged. Occasionally interaction came just after the teacher's extending function (e.g., "Is there anything else we can add?"; "Anything else you'd like to know? (missing data). Most of the interactions, however, appeared to come more autonomously from among the students themselves. (See Appendix A for an example.) Interaction was traceable in the younger children in these studies, too, but to a far lesser extent. We move next to a discussion of the studies about these young ones.

THE YOUNGER CHILDREN

The Swedish Kindergarten Study

For some of the older children, it seemed we had waited almost too late to encourage them to solve people-type problems for themselves.

For some it seemed we had waited too late to encourage them to interact with others in a peer group using a complex process autonomously and respecting themselves and others while probing for solutions. Thus, interested in the roots of creative problem-solving behavior, the investigator next turned attention to young children (kindergarten) in Sweden, assisted by the same Swedish project investigator and encouraged by the Gothenberg School Authorities. We call this the Swedish Kindergarten Study. We wondered, what could children do earlier in the preoperational stage of thinking (to use the Piagetian term), a stage that borders on movement for some into the concrete operational stage?

One task was to see which problem-solving variables that had been appropriate for observation among the middle school samples were still appropriate for inspection at the Kindergarten level. In part the task was to see which variables to delete as entirely too abstract, which variables to add, and which to redefine to fit the qualitatively different ways a young child views the world and constructs intelligence while problem solving. We wanted to become bridge builder between the study of younger and older children. The coding scheme for problem-solving behaviors was accordingly revised (twice to date), as were definitions (Lundsteen & Tarrow, 1981, Pp.359-369).

What did we do? We dropped the elaborated sequence of problem solving steps used by the older children. The grouping and labeling of data and the seeking of movement from concrete to more abstract thought was omitted, as was classification as to type of problem encountered. In fact we concentrated coding mainly on the free-flowing generation of young children's hypotheses and qualities of autonomy and empathy. We concentrated more on watching for natural child development.

What did we find? (Autonomy.) When we found children's autonomous "you-can-do-it--I-can-do-it" type of responses, we looked to see what had just preceded such autonomy and self-confidence. We found that a puppet was always the last stimulus. And the children were addressing the puppet. The puppet was our attention-lengthening and interest-holding substitution for the teacher reading a "cliff-hanging" episode to older children. The puppet was the teacher, of course, but in this role, the teacher was more peer-like. Autonomous remarks in the video tapes collected were never addressed to the kindergarten teachers in the Swedish younger sample. (There were 12 tapes collected at the beginning, middle, and end of the year from four Swedish kindergarten classes.)

Cause-effect and consequential thinking. We speculated that young children would be naturally able to display cause-effect and consequential thinking in the puppet prompted small-group (N = 7) discussions. But we saw relatively little verbalization that we could code as such during the children's video-taped discussions. We had provided no treatment designed to encourage teachers to seek these qualities, no elaborate training program, as in the case of teachers of the older children. Although the teachers saw a video tape of a skilled kindergarten teacher conducting a puppet problem-solving discussion and they had her script, they had no direct instruction in seeking causes and consequences.

The puppet scripts were, however, structured so as to seek children's hypothesis making (in the quandry of losing a friend and then in breaking a friend's car). Generally, within developmental constraints, you get what you seek.

Puppets as stimulus. We discovered the use of puppets and puppet scripts to be an important variable with the younger children. Whereas the older children listened to the problem episode in the relatively abstract mode of the unfinished story, the younger Swedish children had the advantage of the concrete sense of "now" incorporated as the puppet(s) gradually unfolded bits of information. Rather than having an overload of information at one time and having to attempt to store it in memory for retrieval when appropriate, the puppet gradually unfolded bits of information and the children were able to interact more immediately. That is, the young children were communicating directly with the protagonist with the problem.

The teacher. The teacher, as might be suspected, was again an important variable. Teachers who were more open to ideas, elicited more ideas. Again, teachers who controlled (e.g., saying, "But that is not all right,") tended to get children who merely acquiesced and dropped any elaboration, regressing to few (if any) ideas. As before, in regard to interactions between child autonomy and teacher control, in the young Swedish sample we found an echoing of the earlier, older study. To rephrase, when the teacher tried to control the content (not just the process), the children regressed in their verbal behavior.

Diaries and consultant reports. In order to more systematically collect relevant anecdotes, the teachers were encouraged to keep diaries and consultants made monthly observations. Teachers who appeared more flexible, open, and creative in the analyzed puppet discussions elicited this creative behavior in their young children. Such teachers also tended to be creative, flexible, and open in other classroom problem-solving situations. For example, in play with large rollers,

boards, and soft balls (based on Kamii & DeVries, 1978), the children of the reportedly more flexible, open teachers found more things to do with these materials and were more autonomous in approach.

Diaries and reports also seemed to indicate that transfer was occurring in the home. The delightful reported parent conversation found in Appendix B is illustrative of the Swedish kindergarten sample. In general teachers reported increased ease in tackling social difficulties (although much increase in skill may simply have been a function of normal maturing).

Empathy. We did not expect to find the kind of abstract and complex qualities required in displaying actual empathy in such young children. (To us empathy meant putting yourself objectively in someone else's position.) We were interested, however, in related behaviors, forerunners of empathy. For example, the kindergarten children would tell the sad puppet (whose unloyal friend was hostile and playing with another in the sandbox), "I'll play with you;" (and to the puppet who had just broken his friend's car and was deeply troubled), "I can fix it." We added this observed forerunner to the coding scale (that appears in a Figure later in this paper).

Sometimes the teachers confirmed and reinforced these empathetic forerunners by following up on the children's offers of help (e.g., Teacher as Puppet: "What shall we play, then?"). The teacher can not only help in this way to develop forerunners of empathy, but the teacher can also develop children's language abilities and performance in an important register or use of language.

The variable of the puppet scripts. If (in spite of our words to the contrary) the teacher felt duty bound to some predetermined script,

the teacher was less likely to follow children's leads, thus helping them to elaborate and expand ideas. What else did we learn with respect to the scripts? We understood the need to avoid trying to cover every variable conceivable in the problem solving process in every discussion, thus putting children through the "third-degree" when constructing ideas. In a more natural way, we can emphasize one variable during one discussion, and at other times, another.

In retrospect. The important finding was that (according to the transcriptions and translations of video-taped discussions) kindergarten children are capable of offering reasonable and creative ideas as to causes and solutions of social problems. Teachers and parents generally underestimate young children's social problem-solving abilities. Kindergarten children can be quite capable and do not require constant judgemental, interfering, "expert" help from teachers. Chances to solve give chances to develop the language of solving. We can trust children much, confirm their successes rather than dwelling on deficiencies, and in this way encourage language/thought development.

The American Kindergarten Studies

The next step was to pick up American preschool counterparts and attempt to begin to check on the validity of hypothesized universals. During the Swedish studies we had been asking ourselves questions about individual difference variables in the form of certain styles. Consequently, in these last studies we added additional personality behaviors to our observation schemes. These variables, stemming from the work of Rosenberg (1968), take the form of four learning styles: (1) Rigid inhibited,

(2) Undisciplined, (3) Acceptance Anxious, and (4) Creative. (See Figure 7, p. 12a, "Delineation of Four Learning Styles...".)

 Insert Figure 7, "Delineation of Four Learning Styles..." here

The Gooch Study. The first American kindergarten study was at Gooch Early Childhood Center, Dallas Independent School District. We wanted more corroboration for the problem-solving discussion behaviors in as natural a classroom and school setting as possible to verify the early display of successful problem-solving behaviors noted in the Swedish tapes. At Gooch we embarked upon an intensive program of observation, at varying times of the school day, looking for the emergence of styles in individual cases and associations with our problem-solving variables. See the fruits of our labor in Figure in Appendix C "Problem Solving Observation Scale (for Child) Matched to Four Learning Styles and Child Examples for Each Scale Item". When a highly structured classroom morning seemed the order of the day and the variety of problem-solving experiences limited, we developed many experimental tasks for gathering baseline data and for providing solving experiences for us to observe. We retained naturalistic observation, too. For a detailing of the procedures at Gooch in chart form, see Figure 8, p. 12b, & 12c).

 Insert Figure 8 here.

During the work at Gooch, we became interested in the content of the child's response, as well as the process of , say, whether or not the child had fashioned a hypothesis. We look at the content to see what kind of style the child might portray (along with non-verbal body language). For example, one of our typically "Undisciplined"

From: S. W. Lundsteen, *Guiding Young Children's Learning*, McGraw-Hill, 1981. (With N.B. Tarrow)

FIGURE 7

DELINEATION OF FOUR LEARNING STYLES INCLUDING CHILD VARIABLES, CHILD AND PARENT BEHAVIOR AND SOME SUGGESTED CHILD TREATMENTS

LEARNING STYLE	LEVEL OF SYMBOLIZATION	LOCUS OF INFORMATION	TYPE OF PARENT	CHILD'S BEHAVIOR	SUGGESTED CHILD TREATMENT TECHNIQUES
RIGID-INHIBITED	Concrete	Very little (from trusting self) internal or external (little from trusting others)	Authoritarian (restrictive and controlling)	Rigidly follows rules, cannot get job done unless helped; submissive to authority	Encourage ability to function independently. 1. Give concrete explanations, but develop ability to generalize gradually. 2. Provide structure, but encourage child to develop own alternatives (structure). 3. Explain why & encourage child's ability to understand reasons. 4. Use simplification techniques.
UNDISCIPLINED	Functional and moderately abstract	More internal than external	Inconsistent (total direction or none at all)	Disrespectful or negativistic with authorities; breaks rules says, "I won't"; attempts to manipulate; aggressive	Encourage child to control behavior within socially-accepted limits. 1. Set limits; use logical & natural consequences. 2. Maintain a personal relationship, without rejection. 3. Provide feedback on child's behavior & use peer group to provide feedback. 4. Provide opportunities for independent, creative projects of child's choice.
ACCEPTANCE-ANXIOUS	Moderately abstract (anxiety interferes with functioning) Verbalizes conventional concepts	More external than internal	Child-centered (main goal is child's happiness at price of <u>pleasing the parent</u>)	Looks for constant reinforcement; tries hard, meticulous; does something because you want him/her to	Encourage child to set his/her own goals, plan procedures & evaluate results. Achieve emotional independence. 1. Give child support & acceptance. 2. Remove external sources of evaluation; child evaluates self. 3. Provide feedback in an unemotional & impersonal manner--reflecting on achievement, not on person, (Child sees value of self.) 4. Give some leadership roles.
CREATIVE	Abstract	Both internal and external	Creative problem-centered (structure, warmth, respect, fostering independence)	Works independently; uses adults as resources; learns from mistakes; thinks for self; sensitive to others; enjoys learning	Encourage child to continue in problem-solving process. 1. Provide maximum opportunity for creativity, independence, divergent thought & use of intuition. 2. Be ready to accept uniqueness, unusual ideas & new solutions.

Source: We are grateful to Dr. Earl J. Moore, Associate Professor of Education, University of Missouri—Columbia, for his adaptation of Rosenberg's ideas (Rosenberg, 1968) and his incorporation of related styles of parenthood and related treatment techniques; and to Carol Mason Wolfe for her work in developing this table.

MEASUREMENT BESIDES INTENSIVE OBSERVATION (Project: Development of Problem Solving in Young Child)

Setting: Gooch School
America

(What Measure, Given to Whom, by Whom, and When)

MEASURES	N	Admin.: Indiv.; Small Group	N of E	How Often Adminis- tered	When or Over what Period	Comments
I. FOR BASELINE INFOR.						
1. Conservation tasks (Piagetian)	22	Indiv.	1 experi- mentor	1	Sep.-Oct.	
2. Paper Circles (art collage)	22	Sm. Group	1	1	Sep.-Oct.	
3. Dictated Story	22 10	Indiv.	1	3	Sep.-Oct.	For selected subjects, compare beginning, middle, and end
4. Sorting task ("Junk test")	22	Indiv.	2 teams	1	Sep.-Oct.	Used for determining verbal use of abstract, funct. and concrete language and thought, to check approach style
5. The "Burr & Meese" puppet presentation videotaped	10	Indiv.	2	2	Sep.-Oct.	
6. DISD Reading & Math Readiness Test	22	Sm. Group	Tchr.	1	Sep.-Oct.	Relate these scores to other info. gathered
7. "Who in the Class- room"	1 Tchr.	To tchr. (re children)	2	1	Sep.-Oct.	A questionnaire admin. to teacher re Child Style
II. FOR COLLECTING DATA ON SUBJECTS & FOR COMPAR- ISON	1 Tchr.	to tchr. (re children)				
1. Video taping of discussion, puppet script #1, "Elwood"	22	Sm. Group	Tchr. 2 Exper.	3	Dec., (Feb. & Apr.)	The 10 subjects in two groups, 5 ea. (rest of the class in a 3rd) All Videotaped. A coding scheme, "Problem Solving Objective Scale for Child" is applied

MEASURES	N	Admin.: Ind. or Small Grp.	N of E	How Often Admin.	When	Comments
2 Tasks or activities to stimulate problem solving to observe in diff. contexts						
a. Social	10-22	Indiv./ Sma. Grp.	2	3	Once/mo., Nov. to Apr.	10 subjects, (plus any others in class interested) e.g., "Cooperative Village"
b. Cognitive	10-22	Indiv./ Sma. Grp.	2	3	Once/mo., Nov. to Apr.	E.g., Kamii rollers, De Bono task, wordless picture book task
c. Aesthetic (Arts)	10-22	Indiv./ Sma. Grp.	2	3	Once/mo., Nov. to Apr.	E.g., play, child's own puppet scenario, "I am the Master" movement
III. FOR COLLECTING DATA ON PARENTS						
1. Parents interview	10	Indiv. 2 par- ents (if poss.)	2	1	Jan.	Comes after informal observation, openhouse & conversation after parent/teacher, conference with subjects' parent(s)
2. Parent and Child prob. solv. task.	10	2 par- ents (if poss.)	2	1	Feb.	Audio taped
3. Parents teach the child some task	10	2 par- ents (if poss.)	2	1	Apr.	Audio taped
IV. TEACHER	1		2	Ea. Pup- pet dis- cussion	During data analy- sis period	Use "Check list of Teacher Behaviors" (Re Guidance of Young Child. P.Solv. Behavior)

*Note: Experimenters give measures to assess the 10 selected children's responses. However, all the 22 children in the class have the opportunity to participate in the project tasks.

style children hypothesized that the way to solve the "unfaithful friend in the sand box" episode was to throw sand in their faces (a relatively undisciplined or anti-social response). In the case of a child observed to be creative and balanced in style, we saw him produce not only many fluent hypotheses but we noted the content was socially acceptable and unique (e.g., "Bring a tape recorder with you to the sand box and play it and maybe they'll let you play with them.").

The revised problem-solving scale for young children seems to have reached a usable level of functioning. In general, we dropped all previous zero performance or absence of trait categories; we dropped variables that we never could observe during the discussion (such as "tolerance of unknowns") and dropped any of the original five items under each scale category that by this time we had not observed. We found then that the Rosenberg styles do appear in the problem solving discussions and that the scale is functional. We give examples from our latest and present setting, Lanier School.

The Lanier Study. We next moved to replicate our research at another American classroom setting, kindergarten level. It provided a low socio-economic racial mix in America, and the teacher is willing to try various intervention techniques in regard to helping children to reach for more productive styles and the development of problem solving strategies. Some of the following examples to illustrate our findings in regard to relationships between styles and problem-solving discussion are taken from both American kindergarten settings.

Rigid inhibited children tend to contribute little or nothing to problem-solving discussions. Often they do not volunteer hypotheses

and will even find it difficult to come up with ideas when asked directly by the teacher.

Undisciplined children may not contribute to the discussion if they are not involved with the problem (or challenge). Their problem-solving potential tends to be more easily observed when they are motivated and interested. In such cases they may be creative, producing unique ideas fluently. But the content of their suggestions may be anti-social (e.g., "Throw sand on them, if they won't play with you."). One undisciplined kindergarten child produced an incredibly elaborate lying scheme in response to the broken car episode.

Acceptance anxious children will try to contribute to the discussion as part of their pattern of anxiously trying to please. However, if they are too afraid of failure, they do not contribute much to the discussion. One of our subjects was certainly capable but gave up after raising her hand tentatively twice and not being called on. If such a child contributes, it tends to be with ideas that are felt to be socially acceptable (e.g., "You can't do that, that's Elwood's car:" or, "Tell the truth.").

Creative children tend to have a set of responses that stand out from the group. They typically give several hypotheses in a helpful manner and with an air of confidence of finding a solution. These children display their autonomy by saying things like, "I can fix it." They are able to evaluate the progress they are making as they approach solutions. (For example, in response to attempts to repair the broken car, one said, "That doesn't fit there.") Creative children obviously enjoy and relish the whole challenge.

Interestingly, there were some children that did not perform during the discussion as we might expect they would from our intensive observations.

For example, at the Lanier setting one child whose behavior had led us to classify him in the rigid inhibited category, contributed far beyond our expectations during the video-taped problem-solving discussion. In the first place, this challenging activity is usually highly motivating. An advantage is that we may get to see that a child has more potential than previously thought. A child with a relatively low level of style at the beginning of the school year may make significant progress, moving toward more broadly productive styles with the guidance of a skilled and caring teacher. Some cases have a mixture of style, e.g., being both acceptance anxious and having a strong potential for the more balanced creative style or being undisciplined with strong creative potential. In any case at the age of five the situation is apparently not a closed book. Children are still able to develop rapidly as productive creative problem solvers assisted by a broadly enabling creative style of learning and approaching tasks.

SUMMARY AND DEVELOPMENTAL IMPLICATIONS

In summary, we were determined to investigate children's creative problem solving noting how it developed. We had a beginning and have an ultimate intent to intervene, when appropriate, to encourage further development. We started with older children, many on the verge of formal operational thought. We saw deficiencies and saw improvements with training. We noted the crucial, interactive role of the teacher who helps the process of problem solving or hinders its display and development. Feeling that much of interest could be accomplished, and that in some cases waiting until middle school was too late, we moved

to the earlier kindergarten level for observation and research. We changed methodologies to accommodate the qualitatively different thinking of children, including their naturally reduced attention span. With puppets as one of our best stimulators, a revised observation scale is proving a useful tool for analysis.

A Comparison of Cross-cultural Problem-solving Behaviors

Although we had been told that Swedish children are far less verbal, assertive, and autonomous in school than are American children and that the whole Swedish society is more permission conscious, we could find little or no cultural differences as we looked at coded problem-solving discussions. Our problem-solving variables apparently operated in much the same fashion in children in Santa Barbara, Gothenberg, and Dallas.

Autonomy. Of the qualities looked for in problem solving, one of most interest, autonomy, stood out encouragingly. Children in each setting were willing to tackle challenges presented in the discussion context themselves, or to verbalize belief that the main character or the puppet could do so. We did note that in the case of the younger children our examples of autonomy came immediately after an interaction with the puppet (played by the teacher) and not after the teacher playing self. Our last teacher, at Lanier, has adopted the style during the discussion time of always speaking as the puppet and never as herself or even as an outside facilitator. We would like to move outward with our discussion tasks and interfering or facilitating learning styles to other cultures, asking further culturally comparative questions.

Older Versus Younger Children--
Developmental Comparisons

We noted that many of the problem-solving behaviors displayed by the older children were displayed by the younger children who constructed many hypotheses, thought of relevant causes, and fashioned judgments while interacting with the puppet protagonist and their peers. The following are nine developmental implications from comparing the younger and older children.

1. Memory. In comparing the 5- and 6-year old kindergarten children with the middle school children (10, 11 & 12 years old), the older ones (not surprisingly) can keep many more story variables in mind with the help of their more fully functioning memories. The kindergarten subjects were able to keep only one problem in mind and needed to avoid getting overloaded with detail. The older children could have recorded for them in writing ideas of peers during the discussion to be reacted to, grouped and labeled. Although we toyed with the thought of preserving their ideas with regard to the younger children with a quick sketch artist or flannel board cutouts for past, present and future, short memories and nonliteracy set a ceiling. The "nowness" of the interacting puppet helped.

2. Single versus multiple point of view. Generally, our kindergarten children could view a problem only from one point of view at a given moment. For example, our kindergarten children concentrated on why the puppet Elwood might be crying and could not readily leap to concerning

themselves with the problem that the other children in the sandbox did not want to play with him. If there was some transition time between problems, however, they could handle them serially. For example, first the kindergarten children were interested in protecting a toy car from an intruder (as they had promised). But after the intruding puppet had broken the car and pleaded for help, the young children could switch problems and brainstorm hypotheses, trying to help the puppet to fix the car. But then they could think only of that "fixing-it" problem. Understandably, the older children seemed to be more able to see views of several different people almost simultaneously from different angles. "That's a problem for the little boy: his older brother won't play with him; and that's a problem for the older brother, being pestered; and that's a problem for the parents: what a fuss!"

3. Length and amount of response. As might be expected, when the younger children gave their ideas, their responses tended to be shorter, less elaborated. They were just less verbal. Unless specifically asked for causes and consequences in language they could understand, we did not find such thinking. The older children volunteered such thinking much more often. But in the hands of a skilled question-asker and stimulator, the younger children could increase quantity and quality of response.

4. Planfulness. The older children could show more problem-solving steps and more planning. Generally, the younger children needed closure on one problem-solving step at a time. Again, however, the teacher (or puppet) can help, by asking what might come next.

5. Emotional tone. The younger children were more emotionally

and spontaneously involved. Older children were more detached and analytical. The reaction of the younger children could have been a function of the "nowness" of the puppet character and the reaction of the older children could have stemmed from literary detachment with respect to the stories. In future research we plan to use drama and role-play with the older children to check on this difference in emotional tone we have noticed. Older children, of course, can be more objective, more removed and detached because they think more abstractly. The younger children who were more warm ("I'll help you, puppet;" "You can play with me. I love you," may have been influenced by their teachers. Often teachers of younger children display a more warm, loving role than do the teachers of older children in the cultures we have observed. Perhaps there are ways of responding to children that teachers of older and of younger children can learn from each other.

6. Abstract thought. Older children, of course, produced more responses showing abstract thought. Teacher's Guides at the older level provided for the encouragement of abstract thought in grouping and labeling of data and of assigning problems to type. Many of our five year olds, however, indicated some concrete operational thought with respect to Piagetian tasks administered. A few could use double classification. The more creative dealt with symbols. (Example: Experimenter: "What do you think of when I say 'love'?" Kindergarten child with twinkle in eye, "X and O." (Writes them.) Experimenter: "What does that mean?" Child, "X stands for kisses and O stands for hugs."

7. A predisposition to solve. Both age groups accept the motivation that if there is a problem, we try to do something about it. None said, "Well, so what." They accepted our problems to be problems as opposed to

mere facts. For example, in the case of the older children, when the story character stole money from his mother's purse to buy cigarettes, the happening was perceived as a problem for which they would strive for a solution. And in the case of the younger children, when Elwood was crying they said, "We must find out why he is crying and help." Early in a child's life such crying may just be perceived as noise coming from a direction. This need perception was well developed in our kindergarten children. Perhaps we go full circle and lose sensitivity (or the willingness to display sensitivity) when we reach adulthood.

8. Interaction. Younger children addressed most of their comments directly to the puppet and were relatively uninterested in the comments of their peers during the problem solving discussion. Other children increased in interaction with one another over the content of their remarks as the teacher guided them through the process. Developmentally speaking, young children are usually egocentric, but they could be engaged in sustained interaction with the puppet. At Lanier School we are experimenting with having the children create their own puppet scenarios with a puppet center where child puppeteers can engage child audiences in participating and look forward to gathering substantial observations.

9. Social acceptability and moral level of content. Older children were much more cautious to give socially acceptable solutions during the discussion than were the younger children. The "throw sand in their faces" type of solutions was not the sort offered by the older children who are probably more sensitive to evaluative climates in schools. The older children maintained this higher morality of response even in a situation where they were invited to explore unknowns where there was no one right answer. While the verbal problem solving of the older children

was more socialized, the younger children were more easily "corrupted." That is, they could go from a socially acceptable solution ("admit you broke it") to a less socially acceptable one (involving hiding the car and lying about it) rather easily. They were less able to evaluate consequences, perhaps less sure and committed to socially acceptable solutions. Perhaps the younger children simply have more security in voicing the socially unacceptable. Possibly we can apply Kohlberg's theory of stage one or two level of morality to the younger children (Kohlberg, 1975). They are more concerned with staying out of trouble and are therefore willing to lie toward that end. The older children may be more conversant with the third stage and concerned with loyalty and fairness to peers. Our oldest children may even be able to verbalize ideas of social contract, the fourth level.

Within developmental constraints, internalized and relatively longlasting growth in social solutions are not forced. But as children come in contact with peer ideas of a slightly higher level than their's during discussions, genuine construction may occur.

A final word. In conclusion, a thought from an article in American Psychologist by Sampson (1981) seems appropriate to this work. The suggestion is made that some researchers are constantly seeking to explain how children come to be what they are while, other researchers are striving to find out what they can become. Consonant with that latter end, finding children's potential and giving help they need is the general thrust of this presented research series.

Lundsteen ISSBD Toronto, 1981

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APPENDIX A
OPERATIONAL DEFINITIONS
OF PROBLEM SOLVING STEPS & QUALITIES
FOR OLDER CHILDREN

(And a Sample of Interacting Teacher Behaviors)

(Note: For operational definitions for the younger children, see Appendix C.)

PS 013455

Figure 6-2. Qualitative Rating of Steps
Problem Solving in an Oral and Written Composition

<u>No. of points</u>	<u>Description and examples of qualities to be rated</u>
1 = Poor	The child has not followed directions. The child has indicated that he cannot think of a problem, solution -- there is nothing spoken or written for the step.
2 = Fair	The child includes the step but simply constructs a simple relevant (flat) statement as to what is included, i.e., plain, literal comprehension of specifics. "I have trouble crossing the street." (From the problem Step #4)
3 = Well	The child not only includes the step but also describes, elaborates, expands, gives details and examples in regard to the step being rated. "I have trouble crossing streets, freeways, and alleys. For example, there is no stop light at "B" Street. I know a kid that got hit."
4 = Very well	The child has constructed a response that contains not only elements of fluency -- the elaboration above -- but also cause-effect relationships and originality or uniqueness. "I have trouble crossing any street because the cars seem to come too fast. Maybe I need glasses (cause-effect). Crossing makes me late for school. Suppose I got a sore leg and couldn't run fast. Some driver may need glasses, too. I'm kinda little. Maybe I should carry a big white sign with a grapefruit on top that says, 'Driver, watch out for little squirts.'" (originality)
5 = Excellent	The child has constructed a response in which her inference leads her to multiple alternatives, empathy, and a conscious evaluation using a criteria -- a deep understanding or perception of the problem. This response is not only highly fluent, unique, empathetic, and includes many alternatives rather than one, but also has the plus of critical thinking. "The parents need to do something about the traffic problem. I feel I need to work with big people to lick this problem. But also kids could get together in safety council and make plans. Maybe both big people and kids can work on this. We could get help from the newspaper and T.V. We could send out papers on how long it takes to stop from what speed when you first see a kid" (multiple alternatives). That last idea might be the best, if you could actually get every driver to try to stop from each speed. Then a driver would know (evaluation). Drivers would probably appreciate the information. Maybe part of my problem is I need to get up earlier and quit fooling around on school mornings" (multiple alternatives).

Problem solving in an oral composition is measured by a task in which the child responds by speaking into a microphone of a tape recorder to which he has become accustomed. The child is asked to name as many as three problems he might have with a friend or with people. Next he picks one of his problems and tells how he might go about solving it. Thus, if you have a child who is verbally capable but who cannot write well, he has an opportunity to display his skill.

The tape should be transcribed so that you can judge the response according to the scales on steps and qualities.

Figure 6-1. Judgmental Rating Scale for Problem Solving in an Oral and in a Written Composition

To judges: The goal of this scale is to rate the behavior of children. Objectives set for the child are related to steps in the problem-solving process. The qualitative rating of these steps (Poor-Excellent) is explained on the next page. The steps may not necessarily follow this order given on the scale. Look for them any place in the composition. Put a check in the appropriate box.

STEPS	Qualitative Rating of Step					Total for Step
	Poor 1	Fair 2	Well 3	Very well 4	Excellent 5	
The child has been asked to name three problems that he might have with a "friend" or people. (No more is asked for, because the pupil may spend all his time writing problems and never get to the process.) Next, the child picks one; solves it.						
1. <u>Facts and conditions.</u> Named and/or described and/or distinguished specific facts and conditions that might be helpful when seeking a solution to the problem.						
2. <u>Definition.</u> Defined (described) key words in the problem situation and/or clarified ideas. His best definition may be rated as --						
3. <u>Subproblems.</u> Named subproblems that go with the main problem or are a part of it that may be rated as --						
4. <u>Problem.</u> The quality of these problems may be rated as -- (See the next page.) (Give the child the rating for the best that he has achieved.)						
5. <u>Type of problem.</u> Identified (distinguished) this problem as to type or kind, by grouping it with other similar problems and labeling it as to type. His classification may be rated as --						
6. <u>Missing data.</u> Named or described or distinguished missing information that is needed to solve the problem.						
7. <u>Search strategy.</u> Constructed a method(s) for finding the information that is missing.						
8. <u>Hypotheses -- number.</u> Constructed hypotheses for solving the problem. Merely indicate the rating that matches the number.	0	1-2	3	4-5	6 or above	
9. <u>Hypotheses -- testable.</u> Constructed hypotheses that may be rated for "Testability." (The hypotheses could conceivably be evaluated.)						
10. <u>Planned evaluation of hypothesis.</u> Constructed a plan for evaluation of his hypothesis by supporting his choice with reasons.						
11. <u>Principle.</u> Stated a principle for solving the problem or problems of this type.	For advanced students					
12. <u>Applied principle.</u> Applied the principle to the solution of the problem at hand.						

Pupil name (and code no.) _____
 Teacher name (and code no.) _____

Name of judge _____
 Check one: Oral composition ☐
 Written composition ☐

Total points

OBJECTIVES CONCERNING QUESTION TYPES USED IN THE TESTS AND LESSONS
FOR CREATIVE PROBLEM SOLVING

For all of these objectives the condition of an unfinished problem situation or episode, has either been given to the child or has been produced by the child himself. Also, for all objectives the response or product may take the form of speaking or writing. Occasionally the child indicates his preference, given alternatives from multiple choices.

For all the objectives the next hierarchy, representing supposedly desirable qualities, may be hopefully reflected within the verbal product for the child. One or more of these qualities may be found in each response.

This presentation is an instructional sequence. In "real life" these events along the problem-solving process may occur all at once, in any order, in a circular fashion--in any one of a number of ways. The hierarchy is not a locked-in, stepwise, mandatory device.

The child probably cannot describe with desirable quality the main problem in the episode until he had held off judgment and done a number of other things. That is why "Main Problem" is delayed until the sixth objective in the instructional sequence.

1. Facts and Conditions. By speaking or writing, the child supplies the name(s), describes, and distinguishes facts and conditions which might be helpful when seeking a solution to a "people problem" which he himself has constructed or has been given in a literary episode.
2. Definition. The child defines (describes) key words in the problem situation which he constructed or was given and succeeds in clarifying these terms according to criteria.
3. Subproblems. The child names or constructs subproblems that go with the main problem or are a part of it.
4. Missing Data. The child names, describes, and distinguishes missing information that is needed to solve the problem. (Question asking behavior: "What do I still need to know?")
5. Search Strategy. The child describes or constructs a method(s) for finding the information that is missing.
6. Main Problem. The child names, describes or constructs the major problem which may contain parts or subproblems.
7. Type of Problem. The child identifies, names, distinguishes, and describes the problem as to type or kind.
8. Hypotheses. The child describes and constructs hypotheses for solving the problem. (Question asking behavior: "What if- -?")
9. Planned Evaluation of Hypothesis. The child identifies or names one of his constructed hypotheses for solving the problem and constructs a plan for evaluation by supporting his choice with reasons which may reflect confidence in probability and/or anticipated consequences.

Figure 8.

JUDGE'S SCALE AND SCORING DEVICE
for the measure
TELL THE PROBLEM AND MAKE A PLAN

Check one:

Pretest ☐Posttest ☐

Put an "X" in the appropriate box if the quality being rated is present. For each "X" given, count two points. Enter the total score in the boxes for each question in the column at the end where it says QUESTION TOTAL. Even if the response is incomprehensible or the child did not respond at all, give one point in total so that there are no zero scores.

Quality	Questions for Story #1											
	1	2	3	4	5	6	7	8	9	10	11	12
1. LITERAL COMPREHENSION: response shows question understood												6th grade only
2. RELEVANCE: response shows a connection to story; "sticks to topic"												
3. ELABORATION: response shows fluency and details or describes												
4. ORIGINALITY: response is unique or unusual in the group												
5. MULTIPLE ALTERNATIVES: response shows understanding of several alternatives												
6. EMPATHY; response shows child putting himself in another's place or role												
7. CAUSAL THINKING: response tells why or for what reason events may have happened												
8. TESTABLE HYPOTHESES; response possible to assess, observe; usable, feasible												
9. NUMBER OF HYPOTHESES (write number and add in as part of score)												
9. EVALUATION: response shows judgmental effort to evaluate hypotheses with at least implied criteria and with supporting reasons or evaluative thinking on other steps												
QUESTION TOTAL												

Pupil Name _____ Code # _____ Story I Total ☐

Teacher Name _____ Code # _____ Judge Name _____

(Spaces lined out indicate that quality does not apply)

(See elaboration, next page.)

QUALITIES OR TRAITS SOUGHT FOR RESPONSES DURING PROBLEM SOLVING

1. Literal Comprehension (Prerequisite): The child identifies, names, describes and/or constructs a response showing plain, literal comprehension of specifics. (Reference: Bloom, 1956, Taxonomy of Educational Objectives, Cognitive Domain Level 1.) Note: Initially the instructor has the responsibility to determine if the stimulus, e.g., story episode, is sufficiently relevant to the child so that literal comprehension is possible. Later, the child has part responsibility for transforming unfamiliar problems into the familiar.)
2. Relevance: The child identifies...constructs a response showing a connection to the stimulus or story, or that he has "stuck to the topic" rather than "going off into the wild blue yonder," not to return. (Note: The instructor is cautioned, however not to shut off thinking, especially of the timid child, when guiding the discipline of relevance necessary to a goal oriented task. Again, in the first place the goal needs to be relevant to the child, e.g., the child needs to sense a problem. (Bloom, 1956, Taxonomy level 1))
3. Elaboration: The child identifies...constructs a response with details, examples, and descriptions which indicates fluency and which amplifies or enlarges upon the step in the problem-solving process. The response may have been stimulated by a question from the instructor. (Bloom, 1956, Taxonomy Level 2).
4. Originality: Child identifies...constructs a response which is unique or unusual, new or different in the class or group in which he is judged. Generally, others have not thought of the response. The response has not been one repeated by others and is not a limiting mental set. The response may indicate free reign given to speculation and fantasy. (Guilford, 1967, divergent dimension).
5. Multiple Alternatives: The child identifies...constructs a response showing an understanding of several alternatives rather than just one. His response shows understanding that goes below surface or literal events to inference making. The response does not represent inflexible, rigid thinking, e.g., giving one right answer, using words such as "always" and "never" to make over generalizations or getting in a corner. (Guilford, 1967, products of implications).
6. Empathy: The child identifies...constructs a response in which he appears to put himself in another's position or role. He appears in his verbalization to show a feeling for or sympathy for someone else besides himself or an acceptance or preference for this value. (Kratwohl, 1964, Affective Domain, Level 3 Valuing)
7. Causal Thinking: The child identifies...constructs consistently a response showing a relationship between cause and effect. He tries to tell why or for what reason events may have happened. He gives an insightful explanation. Answers may range from simple to complex, from those showing logical inadequacies to those showing validity. This kind of thinking frequently is prompted after an hypothesis for solving the problem has been selected for a plan and is justified as to why it might work best. (Guilford, 1967, products of relations)
8. Testability of Hypotheses: The child identifies...constructs responses for solving a problem which would be possible to assess, observe, measure, responses which are usable, feasible, or practical. The child produces ideas which he could examine systematically and critically. (Bloom, 1956, Taxonomy Level 3--application)
9. Evaluation: The child identifies...constructs a response showing judgmental effort with a conscious criteria--external consensus or internal logic--and he supports his critical thinking with reasons for his judgment which may deal with confidence in probability or consequences. Ability to give reasons is taken as evidence that the judgment was not "snap" or premature but was highly conscious or shows "planfulness." (Bloom, 1956, Level 6--evaluation).

REVISED SUMMARY OF STEPS AND QUALITIES Used in Revised
Curriculum for Older Children

Steps in Problem Solving
in the Instructional Hierarchy

1. Facts and condition. Discriminating facts and conditions surrounding a felt challenge
2. Definition. Defining key terms in the problem
3. Subproblem. Naming subproblems
4. Missing data. Identifying missing data
5. Search strategy. Constructing a search strategy
6. Main problem. Stating the main problem
7. Type of problem. Stating the type of problem
8. Hypotheses. Constructing hypotheses
9. Evaluation. Planning evaluation of the hypotheses selected to be tried first

In that section you also saw the diagrams and behaviors for qualities studied in problem solving.

Qualities in Problem Solving

1. Literal comprehension of meaning
2. Relevance of response
3. Elaboration of response
4. Originality or uniqueness of response
5. Multiple alternatives given in response
6. Empathy indicated in response
7. Causal thinking
8. Testability of hypotheses
9. Evaluative thinking in response

These aspects are measured in all three tasks of problem solving.

OPERATIONAL DEFINITIONS & EXAMPLES OF CODED TEACHER BEHAVIORS
(A SAMPLE) (SWEDEN)

(TEACHER OF OLDER CHILDREN)

Readiness

Openness. The Openness function involves a teacher statement or question that conveys attitudes of acceptance, of being flexible, tolerant of ambiguity, of encouraging students to express themselves freely. The following example of an Openness statement is preceded by an Extending function.

Do you all agree that this is his main problem? Anybody object to this? Who has other ideas? (Extending). If you have different ideas, don't hesitate to tell me. That's very good if you don't agree. Even the wildest idea is okay. (Openness) (Teacher B, tape 1, p.6.)

Teacher B used the Openness function a total of six times, five of these occurred during the initial steps of the first problem-solving session taped. Teacher A did not use the Openness function during the time sampled.

Direction and Reward. The D & R function involves a teacher statement or question that gives the student a positive, verbal reward for responding and implies "keep going; you're on the right track processwise." The following are examples of Direction and Reward.

Good Katarina! Try to find names for the other groups. (Teacher B, tape 1, p.3)
That is an important thing: if he had or hadn't a room of his own. (Are there) More things we ought to know? (Teacher B, tape 1, p.4)

Controlling. Another teacher function is controlling for which the following is an example.

(The discussion concerns how students might find or "search for Missing Data." Notice the "leading" quality in the teacher's statement and the subsequent student's response. The students had been thinking of search strategies that might help them to discover how a troublesome girl behaves at home.)
Lars: Some girl in this class gets together with her (the troublesome one).
Okay? And (the troublesome) the girl says: 'Come with me; we'll go to my house.' She could find out.

Tea.B: You mean you could find out yourself. Is it easy to find out when you just pay a visit? Could you, Benny?
Benny: No, I don't think so. (Teacher B, tape 3, p.4).

Tea.A: Now for the problem solving. Let's try to analyze the problem. The guys are the problem. Right?
All students at once:
Yes. (Teacher A, tape 2, p.6).

(OLDER CHILDREN)

OPERATIONAL DEFINITIONS & EXAMPLES (A SAMPLE) OF CODED STUDENT BEHAVIORS
(FROM SWEDEN)

Definition: Interaction was counted when one student's response directly preceded and apparently influenced the content of another student's response.

Student interaction appeared to be stimulated somewhat by the teacher's Extending function (e.g., "Is there anything else we can add?" Anything else you'd like to know?") However, most of the time interactions seemed to come autonomously from the students themselves. The following is an example.

Eve: The fact that grown-ups don't let the kids in (into grown-up discussions) belongs to that group, too. (Class was grouping data.)

Anna-Lena: It's right in a way, but not in another. It's natural that grown-ups don't want to let in a score of youngsters.

Eve: It's not always a score. It could be only five or six.
(From Teacher A's group of students, Tape 3, p.2).

Definition: Autonomous responses suggest a valuing of independence and self-responsibility.

Autonomy

He, himself, must start going out to look for friends
(Benny, Teacher B, tape 1, p. 6)

Not just bad luck. He, himself, ought to have tried more-- not only been a hanger-on. (He should) Try something for himself; attend a course or something, and not give a hang for those guys (the gang). (Anna-Lena, From Teacher A's group, tape 2, p.6).

APPENDIX B

SWEDISH KINDERGARTEN STUDY

PARENT CORROBORATION

REPORTED DIALOGUE BETWEEN

MARIA AND HER FATHER

PS 013455

A dialogue between Maria and her father: (Once there is some mastery, children like to play with their skills.)

Father: It seems to me that you and Johanna are getting on much better now. You don't fight much any more.

M: I think we fight sometimes.

F: I mean, when you were 5½ and Johanna 3½ you quarrelled often then, remember?

M: Daddy, you listen to a proglem, will you?

F: Well, of course.

M: Someone has got a box with a lid just as big.

F: Well

M: How to do?

F: Don't understand.

M: Only one of them has a box with a lid just as big as the box.

F: Do you mean they could share so one of them gets the box and the other one the lid.

M: That's right. Now, You'll get a harder proglem. Two kids got a banana. What are they to do, guess!

F: They could fight and the strongest kid gets the banana.

M: No

F: Why not?

M: You must not fight.

F: Why can't the strongest kid get the banana?

M: The one who is weak might be strong.

Guess once more!

F: They could divid the banana into parts.

2

M: Certainly. But now we'll have a harder proplem. Two kids have got only one plastic mug.

F: They'll have to dividethe mug.

M: No

F: Throw it away?

M: No

F: One of them will get the mug first and then the other will get it.

M: No

F: Then I don't know.

M: Get another mug from the kitchen. Now a new proplem. Two kids have got a doll .

F: Get a new doll from the kitchen.

M: No

F: Divide the doll into two parts.

M: No

F: They'll both play with the doll.

(Silence)

M: One of them will get the head, the arms, the legs, the other one the body.

F: But the doll will get broken then.

M: (Laughing) Yes (Silent) I am so happy. I have got so many things. Barbie dolls, other dolls and.....

PS 013455

APPENDIX . C
PROBLEM-SOLVING OBSERVATION SCALE
(FOR YOUNG CHILD)
MATCHED TO FOUR LEARNING STYLES

CHILD PRODUCED EXAMPLES FOR EACH SCALE ITEM

(A Revision Used with American Kindergarten Samples)

(This revision was and is used with the American Kindergarten samples.)

Lundsteen

Key: (Style)
 RI = rigid inhibited style
 UD = undisciplined
 AA = acceptance anxious
 C = creative
 (Assignments of style are tentative and general;)

PROBLEM SOLVING OBSERVATIONAL SCALE (FOR CHILD)
 (Matched to Four Styles)

Coder _____ Date _____

Puppet Script _____

Script No. _____ Teacher No. _____

Style	Code No.	Description	Child Code Nos., Tally, Line Nos.							
STRUCTURAL/OPERATIONAL VARIABLES			1	2	3	4	5	6	7	8
	1.	Total No. of Individual Verbal Contributions								
	a.	Total No. of Positive, Classifiable Responses								
	b.	Unclassified Responses								
	2.	<u>Hypotheses Generation</u>								
AA (In order to please)	2.05	Repeats another's idea.								
RI	2.1	Generates partial ideas that might be worked into a hypothesis.								
all	2.2	Generates one hypothesis.								
AA	2.3	Generates more than one when prompted.								
C	2.4	Generates multiple hypotheses with no prodding. (Fluency)								
(Note: lack is typical of RI)										
QUALITIES IMPORTANT DURING PROBLEM SOLVING										
	3.	<u>Empathy</u> (or forerunner)								
UD	3.1	Exhibits "put-down" behavior.								
C AA	3.2	Offers to help puppet directly.								
C	3.3	Expresses positive feeling toward puppet.								

<u>Style</u>	<u>Code no.</u>	1	2	3	4	5	6	7	8
RI AA	4. <u>Autonomy</u>								
	4.1 Child's contribution (behavior or content) exhibits lack of autonomy and/or self-confidence.								
C	4.2 Child's contribution (behavior or content) exhibits some degree of autonomy and/or self- confidence.								
	Examples:								
	5. <u>Causal Thinking</u>								
RI	5.1 Incomplete, implied, or irrelevant causality.								
C	5.2 Asks for reasons.								
C	5.3 Gives relevant reason.								
C	5.4 Gives more than one reason (with or without encouragement).								
	6. <u>Consequential Thinking</u>								
RI	6.1 Gives incomplete, implied, or irrelevant consequences.								
AA, C	6.2 Asks for consequences.								
C	6.3 Gives a relevant consequence.								
C	6.4 Gives two or more related consequences (if A, then B, and then C).								

Style	Code No.	1	2	3	4	5	6	7	8
	7. <u>Evaluative Thinking</u>								
RI	7.1 Produces apparently "snap" judgment and gives no reason.								
UD									
RI	7.2 Passes judgment and gives incomplete, implied or irrelevant reason.								
UD									
all	7.3 Judgment passed supported by relevant reason(s).								
C	7.4 Asks for reasons or information before accepting idea or hypotheses.								
AA (but from adult or authority, anxiously)									
ADDITIONAL VARIABLES									
C	8. Asks for missing data.								
C	9. Gives evidence of planning (at least more than one step involved in child's idea).								
C	10. Child guides problem-solving process. (Specify--refer to teacher behaviors.)								
RI, UD	11. Inaccurate listening.								
	12. Rosenberg style								
C, AA,	13. Interaction								
	14. Other								

By now it is apparent that this research is concerned with two different clumps of constructs, which are related. The first cluster is related to problem solving, e.g., ability to generate hypotheses, give reasons, and demonstrate qualities of autonomous behavior while solving. The second cluster deals with the Rosenberg styles of learning/solving. These styles depend in part on level of abstraction in thought as expressed through behavior and language. And these styles also deal with the individual's ability to use internal and external information (communicated by other people). Consider each of the four styles and some items on some of the measures of problem solving. The numbers in parentheses refer to the scale in the Appendix.

Rigid Inhibited Child. Highly concrete in cognitive functioning in comparison with age mates, and processing little information, this child rigidly follows rules, submitting to authority rather completely and helplessly.

On the problem-solving scale--

1. Total number of responses are few. Of responses given, many or most are unclassifiable (1.b)
2. Lack of, or few, hypotheses generated. May have some partial ideas (2.1)
3. Exhibits nothing in particular in relation to empathy. (3.2, 3.3)
4. In relation to autonomy, likely to show lack of autonomy and/or self-confidence. (4.1)
5. Few, if any, responses showing causal or consequential thinking. Responses given are likely to cluster in the incomplete, implied, or irrelevant. (7.2)
6. Might give snap judgment (7.1), especially if related to some known rule. If reasons are given, they are likely to be incomplete, implied, or irrelevant. (7.2)

In essence, this child has difficulty understanding and communicating ideas--acts basic to problem solving.

Undisciplined Child. Using more internal (self) information than external, this child may be highly negative toward authority, is aggressive, attempts to manipulate, breaks rules.

On the problem solving scale--

1. The total number of contributions is variable, depending on the child's personal, internal interest. Since many of the puppet scripts we used to stimulate child problem-solving responses (video taped) deal with interpersonal social matters, the undisciplined child may not show the full range of his/her creativity in these discussions. This child can perform well--when and if it suits him or her. (1)
2. May or may not show hypothesis generation with indication of creative thought. (2.1 to 2.4)
3. May show "put down" behavior, rather than beginnings of empathy advantageous for social problem solving. (3.1)
4. May show autonomy and self-confidence. (4.2)
5. May or may not give responses that show causal or consequential thinking depending on own pleasure. A sensitive social response as to why

someone is crying may be difficult for the undisciplined to give a reason for. On the otherhand, he/she may well be able to anticipate what will happen in a fight. (5.1 to 5.4)

6. May be negative in judgments of others. (7.1 to 7.3)
7. The asking for reasons before accepting hypotheses may be based on lack of trust of others (7.4)

Acceptance Anxious Child. This child gets more information from external sources. than internal, may verbalize conventional concepts well and be moderately abstract;but anxiety does interfere with level of symbolization.

On the problem solving scale--

1. May have high number of total responses if trying to please teacher or examiner, or low number if afraid of failure. (1)
2. May generate some conventional hypotheses, some repeated from what others say (2.05). More likely to give hypotheses when prompted (2.2, 2.3)
3. May show some of the forerunners of empathy--eager to please and wanting to be liked (3.2 and/or 3.3)
4. Responses may show lack of autonomy and lack of self-confidence.(4.1)
5. May be able to give sensible reasons and consequences. May well understand social situations. Unlikely to give several reasons or consequences at once. (5.3, 6.3)
6. May pass judgment according to conventional standards (e.g., "That's not nice.") (7.3)
7. May ask for reasons, consequences, or reasons for accepting hypotheses, in order to avoid risk--to let adult or authority give the safe answer (5.2, 6.2, 7.4)
8. Probably will not attempt to lead problem-solving process. (10)
9. Probably listens accurately, although anxiety may interfere at times. (11)

Creative Child. Since this scale aims toward a creative style, it probably helps in its identification. The creative style child gets information both from within and externally, achieving a balance. Consequently, with a wealth of information this child tends to be relatively abstract in thinking.

On the problem solving scale--

1. Typically has large number of responses. (1)
2. Likely to show forerunners of empathy (without being dependent on approval (3.2, 3.3)
3. Likely to show signs of autonomy and self-confidence. (4.2)
4. Is not only able to pass judgment and give relevant reasons, but also can delay judgment while seeking pertinent information. (7.3, 7.4)
5. May ask for missing data. (8)
6. Shows evidence of productive planning (several steps). (9)
7. The creative child may guide the problem-solving process. (10)

While we may see several problem-solving behaviors in one or in several of the styles, it is the whole configuration of the responses that builds the picture. The scale is not designed to be a sole identifier of a particular Rosenberg style. Identification needs a multiplicity of avenues. That is, information from this measure needs to be coordinated with that gotten by other means. Our specially designed puppet scripts and discussion guidance strategies need to be reexamined for their stimulation of all types of children (rigid inhibited, undisciplined, acceptance anxious, creative), as they employ stimulated problem solving.

Lundsteen

TOWARD OPERATIONAL DEFINITIONS OF THE BEHAVIORS IN THE PROBLEM SOLVING SCALE

(For the Young Child) (Some Examples) (Taken from the Swedish Kindergarten scripts.)

STRUCTURAL/OPERATIONAL VARIABLES

1. No examples are needed here, as it is just the counting of the responses.

2. Hypotheses Generation

2.05 Repeats another's idea. (Note: a recently added dimension)

The teacher has asked for ideas of games considered to be girls' games.

Joakim: Playing with dolls.

Teacher: That's a girl's game, too. Are there more games for girls?

Simon: Playing with the dolls. (Lines 81-84, Teacher 01, Script 3)

2.1 Generates partial ideas that might be worked into an hypothesis.

As teacher is asking if it is a good idea to put a piece of paper on the broken car, child says,

"Tape." (Carola, Line 233, Teacher 02, Script 2)

2.2 Generates one hypothesis.

In reference to why the puppet might be sad, child says,

"If I get hurt or something, I could be sad." (Anna, Line 22, Teacher 01, Script 1)

In reference to what can be done about a broken car, child says to puppet,

"Instead...you'll go and hide the car." (Mikael, Line 187, Teacher 03, Script 2)

2.3 Generates more than one when prompted.

In response to what puppet can do about playing after being turned away by a friend, child says,

"You can tell her. That you want to play with her."
(Later, after more discussion)

"But maybe he can make another magic potion." (Anna, Lines 99 & 115, Teacher 01, Script 1)

Or, another example:

"Jump skipping rope."

(After teacher asks for help again,)

"Try to find a new friend." (Mattias, Lines 75 & 88, Teacher 02, Script 1)

2.4 Generates multiple hypotheses with no prodding (Fluency).

Again, in response to puppet who has been turned away by a friend,

"Play. Play by yourself. Play with someone else."

(Maria, Line 97, Teacher 01, Script 1)

QUALITIES IMPORTANT TO PROBLEM SOLVING

3. Empathy (or forerunner)

3.1 Exhibits "put-down" behavior. (Antithesis)

When puppet appears, child says,

"Why has he got such silly pants?" (Simon, Line 3, Teacher 01, Script 2)

When puppet has broken another's car,

"You silly idiot, Ingemar!" (Jonas, Line 139, Teacher 02, Script 2)

3.2 Offers to help puppet directly.

When puppet has failed to make magic potion to get friends to play with him,

"You could play with me." (Maria, Line 121, Teacher 03, Script 1)

When the teacher asks who can help the puppet, child exclaims,

"I can!" (Annika, Line 54, Teacher 04, Script 1)

3.3 Expresses positive feelings toward puppet.

Puppet says nobody loves him and so he is sad.

"I love you." (Maria, Line 49, Teacher 03, Script 1)

Lundsteen
(Operational Def., Problem Solving Scale)

4. Autonomy

- 4.1 Child's contribution (behavior or content) exhibits lack of autonomy and/or self-confidence or self-reliance. (Antithesis)

A child jumps in after others have given their ideas.

Carolina: Ask.

Maria: Ask him!

Anna: I think so, too.

Carolina: So do I.

Maria: Me, too.

(Maria, Lines 107 & 202, Teacher 01, Script 2)

- 4.2 Child's contribution (behavior or content) exhibits some degree of autonomy and/or self-confidence.

The child may suggest the puppet act autonomously, as by telling it to "fix it" or to "tell her you want to play with her."

When a puppet tries to take another's car, a child spoke to him directly, telling him to leave it alone. He even took the initiative of calling the owner.

"I'll soon fetch Muppe."

"Muppe, come fo-o-orth!" (Jonas, Lines 75 & 77, Teacher 02, Script 2)

When the car is broken and the puppet is seeking help,

"But I can fix it."

When the puppet is doubtful it would work,

"I can...I can."

The conversation shifts to other possibilities and when the puppet says he'll hide the car, the child says again,

"But I think I can fix it." (Marie, Lines 165, 167, 180, Teacher 03, Script 2)

5. Causal Thinking

- 5.1 Incomplete, implied, or irrelevant causality. (or highly implausible)

In answer to why the puppet could be sad, a child says,

"Don't know. He isn't at...." (Joakim, Line 14, Teacher 01, Script 1)

Lundsteen
(Operational Def., Problem Solving Scale)

5.2 Asks for reasons.

When child hears a puppet crying, she says,

"Why is he crying?" (Camilla, Line 28, Teacher 03, Script 1)

5.3 Gives relevant reason.

When asked why the puppet is crying, a child answers,

"Maybe he has got a headache." (Ronny, Line 7, Teacher 04, Script 1)

5.4 Gives more than one reason (with or without encouragement).

No examples, but coding should be clear. If the responses to one particular situation would individually earn 5.3 classification, the responses would fall into this category.

6. Consequential Thinking

6.1 Gives incomplete, implied, or irrelevant consequences.

In reference to what the puppet could do after being turned away by his friend (and after finding out magic potion couldn't be made on Line 86), a child says,

"Put a band...a band...a banda or apples in it. Then it might turn out right." (Simon, Line 100, Teacher 01, Script 1)

6.2 Asks for consequences.

No examples in the Swedish Kindergarten transcripts. "What would happen if...

6.3 Gives a relevant consequence.

In reference to what the puppet could do who has been turned away by his friend,

"Make a bit of fun, make them laugh. Then they will play with you, I think." (Camilla, Line 113, Teacher 03, Script 1)

When the teacher asks what the other puppet will say when he sees the wheels of his car are broken, child says,

"He is going to feel bad, I think." (Sandra, Line 73, Teacher 04, Script 2)
Script 2)

Lundsteen
(Operational Def., Problem Solving Scale)

6.3. cont.

In speaking to the puppet about what to do with the broken car, a child says,

"Ingemar, look here, if you eat up the car, Muppe can't find it, can he?" (Jonas, Line 184, Teacher 02, Script 2)

6.4 Gives two or more related consequences (if A, then B, and then C).

No examples. However, if a child were to say something like this to the puppet that had broken the car, it would count.

"If you fix the car, then Muppe won't be mad at you and then you could play together."

7. Evaluative Thinking

7.1 Produces apparently "snap" judgment and gives no reason.

Generally, these were a "yes" or "no" response to a teacher's question. For example, "Do you think that's a good idea?" "Yes." Note the child does not elaborate. "T.: We must tell him, mustn't we? Joakim: Yes." (Lines 94-95, Teacher 01, Script 2)

7.2 Passes judgment and gives incomplete, implied or irrelevant reason.

The teacher refers to a magic potion making the puppet's friends "kind and nice," and the child responds,

"Not quite that. But in the fairy tales." (Joakim, Line 64, Teacher 01, Script 1)

7.3 Judgment passed supported by relevant reason(s).

Children are discussing what they will tell the puppet who owns the car about its being gone. There is a suggestion they tell him that the other puppet borrowed it.

Simon: He took it.

Teacher: He took it, so he didn't borrow it, then?

Simon: No, he is a thief. (Simon, Lines 124 & 126, Teacher 01, Script 2)
(His judgment of the puppet being a thief is backed up by the reason that he took the car, which Simon stated in the first line.)

7.4 Asks for reasons or information before accepting idea or hypotheses.

The crying puppet has denied he is crying, asserting that boys "aren't supposed" to cry. The teacher says, "Of course boys are supposed to cry." The child says,

Lundsteen
(Operational Def., Problem Solving Scale)

7.4, cont.

"Ask him how old he is!" (Joakim, Line 27, Teacher 01, Script 1)

ADDITIONAL VARIABLES

8. Asks for missing data.

In talking about how they could fix the car by pasting the wheels, a child asks,

"I wonder where the wheels are?" (Ronny, Line 135, Teacher 04, Script 2)

9. Gives evidence of planning (at least more than one step involved in child's idea.

The children are discussing how the puppet can deal with the broken car and the friend who owns it. The idea of hiding the car so the friend won't see it has already been mentioned.

Simon: Drive him off, so he can't get there.

Puppet: Drive him off. What'll I say to him?

Simon: Let's go back to the sandbox.

Puppet: So he and I go back to the sandbox?

Simon: Yes.

Puppet: And he'll never get in there.

Simon: Yes.

Puppet: Aha! But when he wants to pick up the car later on, what about that?

Simon: We could go on playing all day.

Puppet: Hm...So we can do that?

Simon: In the evening you could hide the car and try to mend it.

(Simon, Lines 183-194, some of them, Teacher 01, Script 2)

10. Child guides problem-solving process. (Specify--refer to teacher behaviors.)

In this example the child focuses on the problem and the search for possible solutions.

The puppet has just taken the car away that doesn't belong to him. The teacher asks the children what they think. One child says that the puppet must not take away the car.

"What to do then, if he must not." (Joakim, Line 114, Teacher 01, Script 2)

11. Inaccurate Listening

In response to the teacher's question, "What am I to put apples in?" the child answers,

"Yes." (Simon, Line 103, Teacher 01, Script 1)

12. Rosenberg Style

In the Swedish data for the younger children there are no examples of the styles. They were not a variable under observation at that time. But the revised Problem Solving Observational Scale (for young children's behaviors) indicates which scale behaviors we would expect to be typical of the various styles as we examine the newer American data.

For Example, when in the earlier example #3.1 Simon exhibited "put-down" behavior toward the puppet (instead of empathy) ...

"Why has he got such silly pants?"

we might be tempted to assign this response to an undisciplined style, but we do not have corroborating observations for this subject.

13. Interaction

As conceptualized in the study of older children, interaction was recognized when one student's response directly preceded and influenced the content of another student's response, resulting in new ideas for solving based on information from others. Yet the interactional response had elements of originality in the synthesis (not just mere echoing or repetition).

"Teacher: What do you think about this? (A puppet intends to use another puppet's toy without permission.)

Anna: That he must not...

Joakim: (interacting) What to do, then, if he must not.

Simon: (possibly interacting with Joakim) Tell him.

Joakim: (interacting with Simon) Tell him there! (Points to the place the other puppet exited.) (Lines 111 to 117, Teacher 01, Script 2)

14. Other

As we add more and more cases to this study, we are, of course, open to additions to codable problem-solving behaviors and relevant accompanying behaviors that show promise of furthering our understanding of development.